Estimating migration flows at the local level in the US

Ernesto F. L. Amaral

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Workshop: Uncertainty and Complexity of Migration

TEXAS A&M UNIVERSITY

Objective

- Estimate factors associated with internal and international migration flows at the local level in the US
  - 1950–2000 Demographic Censuses
  - 2005–2016 American Community Surveys (ACS)
- Analyze restricted data at the Texas Research Data Center (TXRDC) at Texas A&M University
  - Block group and county of current residence
  - County of residence five years (census) or one year (ACS) before the survey
- Estimate individual- and area-level models
  - This exercise was not previously performed using a historical perspective at the local level in the US

Individual-level models

- Multinomial logistic regressions will estimate the association of independent variables with a dependent variable related to migration status
  - **Internal migrants** are those who resided in another county in the US five years (census) or one year (ACS) before the survey
  - **Short-term immigrants** are those who resided in another country five years (census) or one year (ACS) before the survey
  - **Long-term immigrants** are those born in another country
  - **Non-migrants** are natives who resided in the same county in previous years

Sample by migration status and race/ethnicity, 2011–2015

Migration status	White	African American	Hispanic	Asian	Native American	Other races	Total
Internal migrant	4.69	5.76	3.31	1.86	4.53	6.31	**4.51**
Short-term immigrant	0.32	0.43	0.78	2.92	0.24	0.84	**0.53**
Long-term immigrant	4.05	8.23	34.76	64.42	1.11	11.72	**11.79**
Non-migrant	90.94	85.58	61.16	30.79	94.11	81.12	**83.17**
Sample size	10,722,931	1,634,504	2,189,075	763,531	153,099	354,317	**15,817,457**

Source: 2011–2015 American Community Surveys (ACS), Five-Year Sample.

Independent variables

- Individual characteristics
  - Age
  - Sex
  - Race/ethnicity
  - Educational attainment
  - Marital status
  - Labor force status
  - Occupation and industry
- Household characteristics
  - Number of own family members
  - Number of own children
  - Number of own children under age five
- Contextual characteristics

Area-level models

- Poisson regression models will estimate variations of area-level counts of migrants, as the dependent variable
- Gravity models
  - These models will have a set of independent variables, including distance between areas
- Spatial models
  - Influence of neighboring areas at origin and destination on the likelihood of migrating, using a Bayesian statistics approach (Anselin, Rey 2014, LeSage, Pace 2008, 2009)
- Integration of individual-level and area-level models
  - Distance and spatial terms will be introduced in the individual-level models as additional sets of predictors

Gravity models

- Poisson models will use population at the beginning of the period (P_i), population at the end of the period (P_j), and distance between areas (d_{ij}) to estimate migration flows
  (Head 2000; Lowry 1966; Pöyhönen 1963; Stillwell 2005, 2009; Tinbergen 1962)

$$M_{ij} = exp\left(b_0 + b_1 \log P_i + b_2 \log P_j + b_3 \log d_{ij}\right) + \varepsilon_{ij}$$

  - M_{ij}: counts of migrants at the end of the period between areas of origin (i) and destination (j)
  - b_0: constant
  - b_1: coefficient associated with the population in area of origin at the beginning of the period (P_i)
  - b_2: coefficient associated with the population in area of destination at the end of the period (P_j)
  - b_3: coefficient related to the distance between areas (d_{ij})
  - ε_{ij}: random error term associated with all pairs of areas

Spatial models

- The general spatial autoregressive model takes into account origin, destination, and origin-to-destination dependence (LeSage, Pace 2008, 2009)

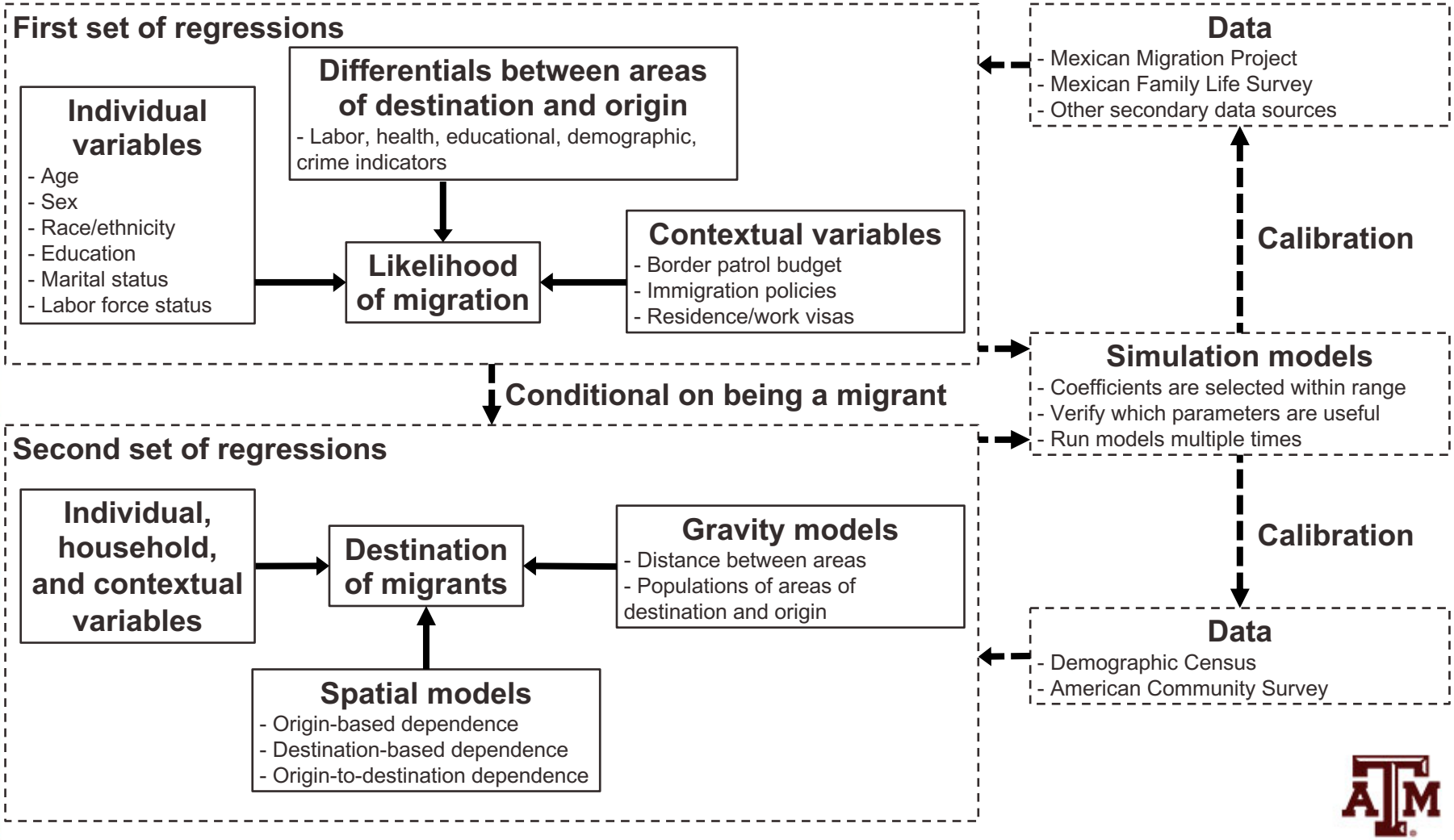
$$y = \rho_d W_d y + \rho_o W_o y + \rho_w W_w y + \alpha \iota_N + X_d \beta_d + X_o \beta_o + \gamma g + \varepsilon$$

  - W_d: spatial dependence at the destination
  - W_o: spatial dependence at the origin
  - W_w: interaction between origin and destination neighbors
  - X_d: characteristics for each of the regions of destination
  - X_o: characteristics for each of the regions of origin
  - Scalar γ: effect of distance g
  - α: constant term parameter on ι_N regions

Agent-based models

- Agent-based models can incorporate interactions between individual decisions, behavioral responses, and social networks related to migration outcomes (Massey, Zenteno 1999; Klabunde, Willekens 2016; Klabunde et al. 2017)
- These models can formalize interconnections and simulate potential feedback relationships between migration streams and several endogenous predictors
  - Education systems
  - Labor markets
  - Healthcare systems
  - Migration policies, border security
  - Social networks
- Agent-based models allow us to build different scenarios and simulate future population flows (Kabunde et al. 2017)

Model migration flows in the US



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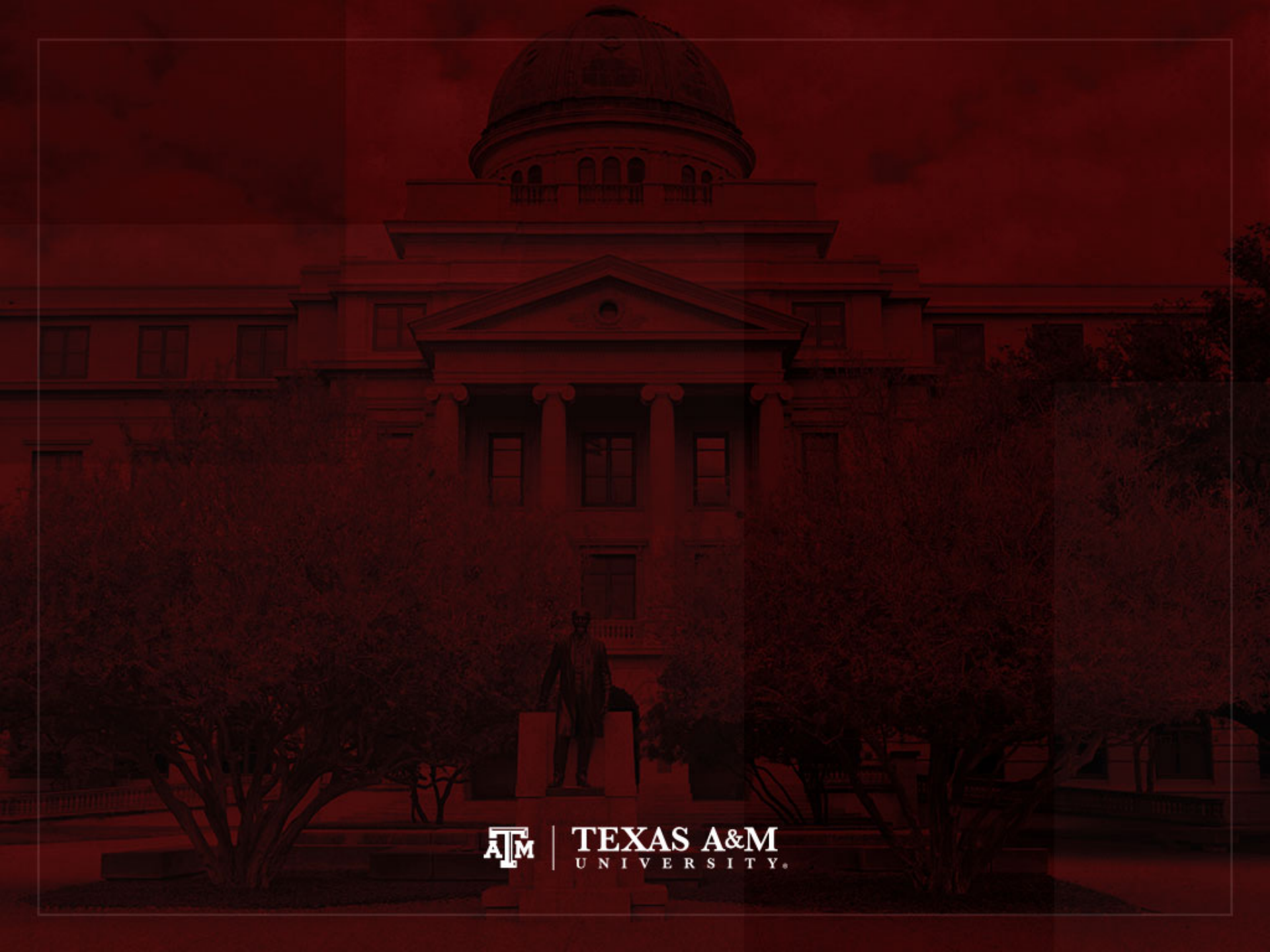
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